REMARKS

Applicants respectfully request reconsideration and allowance of the present application based on the foregoing amendments and following remarks. By this amendment, claims 10, 18, 25 and 34 have been amended and claims 19 and 26 have been canceled. The amendments should be entered under Rule 116 because they raise no new issues and/or they reduce issues for appeal. Upon entry of this amendment, claims 10, 15-18, 23-25, 30, 31 and 34 will remain pending in the application.

Claim Rejections under 35 U.S.C. § 112, first paragraph

Claims 10, 18, 19, 23-26, 30, 31 and 34 stand rejected under 35 U.S.C. § 112, first paragraph as failing to comply with the written description requirement. For reasons set forth below, Applicants respectfully request that the rejections be withdrawn.

Claims 10, 18, 25 – "determining an average height" and "determining an average height error value"

The Office Action asserts that these limitations are not supported by the original disclosure and thus are new matter. While not necessarily acquiescing to the Office Action, these limitations have been canceled from the claims, rendering the rejections based thereon moot, and reducing issues for appeal.

Moreover, the Office Action states that "it is clearly seen from these sections [of the specification] that a position of a receiver is determined based on . . . a height "h" . . ., wherein the height is referred to a height of points above sea level of height of a reference station." (Action at 2-3, emphasis added). Accordingly, the claims have been amended in conformance with the Examiner's confirmation of support in the specification. For example, claim 10 now recites "determining a height value associated with the reference location," which height value is then used to determine a position (including altitude) of a receiver. Because this amendment is in conformance with the Examiner's interpretation of the claims and the specification, no new issues are raised and/or issues for appeal are reduced. Accordingly, the amendments should be entered under Rule 116.

Claims 19 and 26 – "maximum" and "minimum" height of the receiver

The Office Action asserts that these limitations are not supported by the original disclosure and thus are new matter. While not necessarily acquiescing to the Office Action, these limitations have been canceled from the claims, rendering the rejections based thereon moot, and reducing issues for appeal.

Claim Rejections under 35 U.S.C. § 112, second paragraph

Claims 10, 15-19, 23-26, 30, 31 and 34 stand rejected under 35 U.S.C. § 112, second paragraph as being indefinite. For reasons set forth below, Applicants respectfully request that the rejections of the claims are in error and should be withdrawn.

Claims 10, 18, 25 and 34 – "average height of the receiver" and "average height error value"

The Office Action asserts that these limitations are indefinite. While not necessarily acquiescing to the Office Action, these limitations have been canceled from the claims, rendering the rejections based thereon moot, and reducing issues for appeal.

Claims 19 and 26 – "maximum" and "minimum" height of the receiver

The Office Action asserts that these limitations are indefinite. While not necessarily acquiescing to the Office Action, these limitations have been canceled from the claims, rendering the rejections based thereon moot, and reducing issues for appeal.

Claim Rejections under 35 U.S.C. § 102

Claims 10, 15-19, 23-26, 30 and 31 stand rejected under 35 U.S.C. § 102(b) as being anticipated by P. Ptasinski et al., Journal of Navigation, 2002, chapter 55, pp. 451-462 ("Ptasinski"). Applicants respectfully traverse the rejections for reasons set forth more fully below.

Applicants restate and incorporate herein the previous remarks against this rejection. For efficiency, Applicants' remarks below will focus on the following requirements of the claims.

More particularly, amended independent claim 10, with similar subject matter in claims 18 and 25 requires, inter alia:

[a] solving at least three simultaneous equations with the height value associated with a reference location that results in a position and a corresponding horizontal error ellipse;

[b] fitting a two-dimensional polynomial to the corresponding horizontal error ellipse; and

[c] solving the at least three simultaneous equations and the two-dimensional polynomial that results in an altitude of the satellite positioning receiver

The Office Action primarily relies on Figures 1 and 2 of Ptasinski for teaching this subject matter. However, these figures and corresponding text merely illustrate inaccuracies that can occur when using spherical versus an ellipsoidal model of the Earth when obtaining positioning information from a pseudo satellite located at the center of the earth.

For convenience, Figures 1 and 2 of Ptasinski are reproduced below, along with the corresponding text.

> If less than four pseudo-range measurements to different satellites are made, then the normal system of positioning equations is under-determined, and the position unknowns cannot be solved. Hence, the complete 3-D GPS navigation solution is unavailable. In performing 2-D positioning using altitude aiding, it is assumed that an additional range measurement is available that is exactly in the vertical direction relative to the Earth's surface; this is equivalent to having a satellite at the centre of the Earth (Parkinson and Spilker, 1996; Burnley and Braisted, 2000). This range measurement is effectively a distance from the centre of the Earth to the user antenna based on the assumption that the user altitude above the reference ellipsoid is constant. WGS-84 is the ellipsoidal model or the Earth used in GPS positioning (DoD, 1996). Because of the non-spherical shape of the Earth the altitude can be only considered as a range using spherical approximation if the approximate location of the calculated position is initially known.
>
> As can be seen from Figure 1, another problem, which results from the non-spherical shape of the Earth, is that the normal N, which is exactly in the direction to point P, does not go through the centre point of the ellipsoid. The description given in the literature (Parkinson and Spilker, 1996; and McBurnley and Braisted, 2000) uses the centre of the ellipsoid as the centre of the sphere representing the constant altitude.

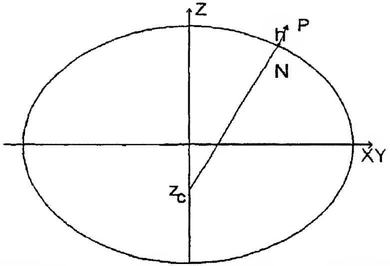

Figure 1. WGS-84 ellipsoid and normal N in the direction to point P with altitude *h* over the ellipsoid.

A simulation has been carried out to determine the inaccuracy of locating a pseudo- satellite at the centre of the Earth (see Figure 2). Assuming that a given sphere should be exactly over the provided area of the reference ellipsoid, we placed the centre of the sphere at the centre of the ellipsoid. The sphere radius was the distance between the centre and the predicted point location. Changing the position of the point on the sphere within a distance of ± 100 m, the maximum deviation of the distance from the sphere over the reference WGS-84 ellipsoid was observed. The selected point had coordinates: latitude 45° N, longitude 0° and ellipsoidal height 100 m. These values were chosen based on the fact that, for latitude of 45°, the approximation would be the least accurate, longitude value would not affect it, and 100 m was taken as a hypothetical ellipsoidal height for land applications. The maximum change from the assumed distance (altitude) between the ellipsoid and sphere was 0-4 m. <u>The same simulation was performed with the centre of the sphere placed at the point (0, 0, z_c), which lays exactly on the normal N.</u> The sphere radius was the distance between this point and the predicted point location. In this case, the maximum change of the distance between the reference ellipsoid and a given sphere was less than 2 x 10^{-5} m. Usually the altitude error is in a range of a few to tens of metres. In this case, both of the approximations are reasonably accurate. However, using the second proposed method would give more accurate results.

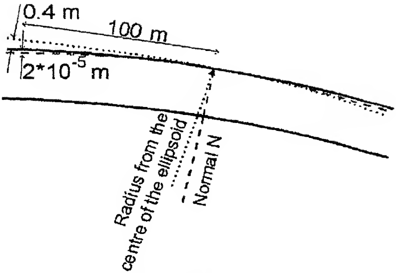

Figure 2. Inaccuracies due to different locations of pseudo-satellites.

There is nothing in these passages or figures that explicitly teaches or suggests the following requirements of the claims:

[a] solving at least three simultaneous equations with the height value associated with a reference location <u>that results in a position and a corresponding horizontal error ellipse;</u>

[b] <u>fitting a two-dimensional polynomial to the corresponding horizontal error ellipse;</u> and

[c] <u>solving the at least three simultaneous equations and the two-dimensional polynomial that results in an altitude of the satellite positioning receiver</u>

The passages on pages 453 to 456 of Ptasinski set forth standard positioning equations that use altitude-aiding information. However, nowhere does Ptasinski teach or suggest that the solution of these equations <u>that results in a position and a corresponding horizontal error ellipse</u>, much less fitting a polynomial to the ellipse, and <u>solving the equations using the polynomial to find an altitude of a receiver</u>, as is explicitly required by the claims.

The Office Action states that:

> To compute a GPS position on the surface of the earth, Ptasinski notices that an error will occur due to the earth not being a sphere and thus compares the

> difference between the points on the ellipsoid and the sphere to obtain an approximate error between the positions on the ellipse and positions on the sphere. Thus the points on the ellipse form an error ellipse since they are approximations compared to a spherical earth. Ptasinski uses the approximations in an altitude-aiding equation to compute an accurate 3-D GPS position (see pages 452-454).

This statement is factually incorrect, and in any event does not meet the limitations of the claims. As the above passages explain, Ptasinski merely performed <u>simulations</u> to compare solutions using a spherical or ellipse models of the earth. In the simulation, Ptasinski merely moved the center of the sphere (representing the pseudo-range to the pseudo-satellite) to account for the difference. This different sphere center is then used in altitude-aiding equations (see page 453, line 20, parameter c_s), which equations then proceed as usual. There is no solving of these altitude-aiding equations <u>that results in a position and a corresponding horizontal error ellipse</u> whatsoever, and in any event Ptasinski aims at eliminating errors by the shifted center.

Importantly, the only description of an "ellipsoid" in Ptasinski is an ellipse model of the surface of the earth. Ptasinski does not disclose or suggest any "ellipsoid" that <u>results</u> from solving three simultaneous equations that are derived from positioning signals, as explicitly required by the claims.

The Office Action further states at 18 that: "Ptasinski disclose a polynomial (the sphere of pages 452, 453) fitted over an error ellipse (figs. 1 & 2) to obtain an error in position calculation in an altitude aiding equation (see pages 452-454)." This position is not understandable, and again does not meet the limitations of the claims. A polynomial is a mathematical equation of at least two variables. A sphere is a sphere. No one skilled in the art would equate a polynomial with a sphere. Moreover, figures 1 and 2 merely show the differences between a sphere and an ellipsoid model of the earth, and explain how simulations are used to move the center of the earth for a pseudo-satellite. In any event, there is no teaching or suggestion in Ptasinski of <u>fitting a two-dimensional polynomial to the corresponding horizontal error ellipse</u>; and <u>solving at least three simultaneous equations and the two-dimensional polynomial that results in an altitude of the satellite positioning receiver</u>. Rather, Ptasinski merely shifts the center of the earth (corresponding to the pseudo-satellite), and the altitude-aiding equations proceed as usual.

Finally, the Office Action states that Hancock discloses a polynomial fit over a grid of points. (Action at 17.) However, only Ptasinski is relied upon for the § 102 rejection, not Hancock.

Independent claims 18 and 25 recite limitations similar to those in independent claim 10. Accordingly, Applicants respectfully submit that independent claims 18 and 25 distinguish over Ptasinski for reasons similar to those set forth above with respect to independent claim 10.

Claims 15-17 depend from independent claim 10. Claims 19, 23-24 depend from independent claim 18. Claims 26, 30 and 31 depend from independent claim 25. Accordingly, Applicants respectfully submit that the rejected claims distinguish over Ptasinski for at least the reasons set forth above, and so the rejections should be withdrawn.

Claim Rejections under 35 U.S.C. § 103

Claim 34 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Ptasinski in view of U.S. Patent No. 6,202,023 to Hancock et al. ("Hancock"). Applicants respectfully traverse this rejection for reasons set forth below.

Applicants restate and incorporate herein by reference their previous remarks regarding this rejection. To the extent possible, the following remarks will focus on new points raised in the current Office Action.

Independent claim 34 recites, inter alia:

> a horizontal error ellipse parameter in an altitude equation that forms an <u>error ellipse having a major axis and a minor axis that corresponds to an altitude error about the initial height of the receiver;</u>
>
> <u>a plurality of points along the major axis and the minor axis that form a grid of grid points that the controller accesses the digital terrain elevation data in memory at the grid points</u>; and
>
> a two-dimensional polynomial surface fit over the grid points.

The Office Action relies on Ptasinski for disclosing the claimed subject matter that is underscored above. Hancock is only relied upon for the claimed polynomial surface fit.

Applicants respectfully submit that Ptasinski, even if one skilled in the art would combine it with Hancock as alleged, does not disclose or suggest the invention as a whole as set forth

clearly in the claims. In particular, the Office Action does not set forth a prima facie case of obviousness, at least because all claim limitations are not taught or suggested by the alleged combination of Ptasinski and Hancock.

As set forth above, Ptasinski merely teaches that location errors can be introduced when spherical approximations are used together with the ellipsoid model, for example in altitude aiding applications where a pseudosatellite is located at the center of the Earth. Ptasinski then introduces equations and a methodology for estimating a position using conventional altitude-aiding equations that allegedly overcome these approximation errors.

However, nowhere does Ptasinski teach or suggest the invention having the claim limitations that are explicitly set forth in independent claim 34.

As convincingly demonstrated in Applicants' previous responses, independent claim 34 clearly requires forming an error ellipse having a major and minor axis that corresponds to an altitude error about the initial height of the receiver. Just because Ptasinki notes that an ellipsoid model of the Earth is used by WGS-84 does not mean it teaches or suggests forming such an error ellipse. Ptasinksi does use the words "ellipsoid" and "error". However, Ptasinksi does not combine these words into a teaching of an invention of forming an error ellipse having a major and minor axis that corresponds to an altitude error about the initial height of the receiver. Those skilled in the art would not confuse an ellipsoid model of the Earth, as described in Ptasinski, to an error ellipse having a major axis and a minor axis that corresponds to an altitude error about the initial height of the receiver as required by the clear limitations of the claims. Nor would the skilled artisan be led to determine such an ellipse merely because Ptasinski also discloses errors in altitude estimation using spherical-based altitude aiding data.

With regard to these clear claim limitations, the Response to Arguments states that these facts demonstrating that Ptasinski's ellipsoid is not the same as the claimed error ellipse are "not convincing" because "applicant does not provide a definition of 'error ellipse' as claimed." (Action at 16.) The Response further states that "the MPEP recognizes that the subject matter of the claims need not be described literally . . . in order for prior art to anticipate the claims." (Id.) This position ignores that the claims themselves define the claimed error ellipse as an ellipse "having a major axis and a minor axis that corresponds to an altitude error about the initial height of the receiver." Applicants' arguments have convincingly demonstrated that the claims have

limitations that are not taught or suggested by the prior art. It is therefore irrelevant whether certain isolated words in the claims such as "ellipse" are also found in the cited prior art as broadly construed. Rather, the test of obviousness is whether the invention as a whole and meeting all claim limitations is taught or suggested by the prior art .

As further demonstrated by Applicants' previous responses, independent claim 34 clearly requires a plurality of points along the major axis and the minor axis that form a grid of grid points that the controller accesses the digital terrain elevation data in memory at the grid points. Ptasinski discloses altitude aiding data, but it does not teach or suggest accessing data from memory at grid points as clearly required by independent claim 34. The Office Action points to Figures 1 and 2 of Ptasinski, which show ellipses and points. However, one skilled in the art would not be taught anything from these Figures about how to access data in a memory using these points, much less a plurality of points along the major axis and the minor axis [of an error ellipse] that form a grid of grid points that the controller accesses the digital terrain elevation data in memory at the grid points.

In the Response to Arguments, the Examiner states that the claimed plurality of points that correspond to an altitude error "is not claimed" as a particular limitation. (Action at 17.) Applicants respectfully submit that the Examiner is again focusing on words in isolation and ignoring the invention as a whole as required by all the claim limitations and antecedent basis within the claims. The claims require a plurality of points along the major axis and the minor axis that form a grid of grid points. The major and minor axes on which the points lie are axes of the claimed error ellipse, which is further required by the claims to correspond to an altitude error about the initial height of the receiver. Accordingly, contrary to the Response to Arguments, the claims clearly require that the claimed plurality of points along the major and minor axes correspond to an altitude error about the initial height of the receiver.

The Response to Arguments further states that "the points on the ellipse (in Fig. 1) form an error ellipse since they are approximations compared to spherical earth." (Action at 18.) This position yet again ignores the clear limitations of the claims, which require the claimed error ellipse as "having a major axis and a minor axis that corresponds to an altitude error about the initial height of the receiver." Just because Fig. 1 shows an ellipse and because Ptasinski further teaches errors between approaches in locations using spheres and ellipses does not mean that

Ptasinski clearly teaches to those skilled in the art how to form an error ellipse "having a major axis and a minor axis that corresponds to an altitude error about the initial height of the receiver" as clearly required by the claims. The notion that claims can be interpreted broadly during examination does not mean that entire claim limitations can be removed and the invention as a whole completely glossed over . The test of obviousness is whether Ptasinski and/or Hancock teaches or suggests and error ellipse having a major axis and a minor axis that corresponds to an altitude error about the initial height of the receiver and a plurality of points along the major axis and the minor axis that form a grid of grid points that the controller accesses the digital terrain elevation data in memory at the grid points. It is not sufficient for the Office Action to pick and choose claim words in isolation and match them up with words and drawings in the cited prior art, and then form an overall theory why these words can be strung together in complete sentences that appear similar to the claims.

Finally, the Response to Arguments refers to Hancock as "clearly" showing a "grid of grid points" in Fig. 1 and cols. 4 and 6. (Action at 13.) Indeed, Hancock appears to show a grid placed relative to a reference point. However, it is not enough for Hancock to show a grid of points. What the claims require, and which Hancock utterly fails to teach or suggest is a plurality of points along the major axis and the minor axis [of an error ellipse corresponding to an altitude error] that form a grid of grid points that the controller accesses the digital terrain elevation data in memory at the grid points. So just because Ptasinski shows an ellipse and Hancock shows a grid does not mean that those skilled in the art would be taught by this alleged combination how to construct an error ellipse and grid points according to the invention as a whole and meeting all claim limitations.

For at least these reasons, therefore, Applicants respectfully submit that independent claim 34 patentably distinguishes over Ptasinski in combination with Hancock.

Conclusion

All objections and rejections having been addressed, it is believed that the claims are in condition for allowance, and Notice to that effect is earnestly solicited. If any issues remain which the Examiner feels may be resolved through a telephone interview, s/he is kindly requested to contact the undersigned at the telephone number listed below.

Respectfully submitted,
PILLSBURY WINTHROP SHAW PITTMAN LLP

Date: October 19, 2010

40,580
Mark J. Danielson — Reg. No.
(650) 233-4777
Please reply to customer no. 96818